MICHIGAN DEPARTMENT OF COMMUNITY HEALTH
EPIDEMIOLOGY OF STROKE FACT SHEET
DECEMBER, 2002

STROKE IN MICHIGAN

MORTALITY

In 2000, stroke was the third most common cause of death in Michigan and a major cause of hospitalization and disability. In 2000, stroke was responsible for 5,789 or 6.7% of all deaths. Figure 1 displays the number of stroke deaths by age, race and gender. One in eight stroke deaths occurred in individuals under age 65, and 48% of stroke deaths occurred in individuals between the ages 65 to 84. Eighty-seven percent of those dying from stroke were Caucasian and 12% were African-American.

HOSPITALIZATION

In 2000, there were 37,405 hospital admissions for stroke (2.9% of all admissions). Figure 2 displays the number of hospitalizations by age, race and gender. Approximately one in four admissions occurred in patients less than 65 years old, and 60% of all admissions occurred in individuals between the ages 65 to 84. Eighty-four percent of those hospitalized were Caucasian and 15% were African-American.

GENDER AND RACIAL DIFFERENCES

Although males have a higher risk of dying of stroke than females, the number of females dying of stroke is larger than for males, because women live to older ages when stroke is most common. In 2000, 60% of all stroke victims were women. There are also striking racial and gender differences in the average age of hospitalization and death due to stroke:

Average Age of Hospitalization and Death

	Caucasian		African-American	
	Male	Female	Male	Female
Hospitalization	70.4	73.8	63.4	65.9
Death	77.2	82.3	68.2	74.8

Figure 1
Number of Stroke Deaths, Michigan, 2000

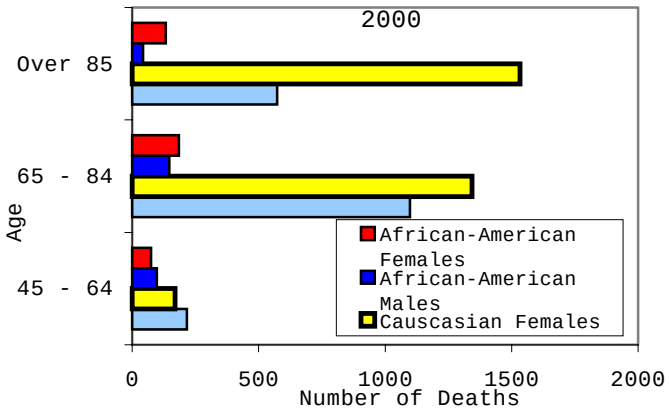
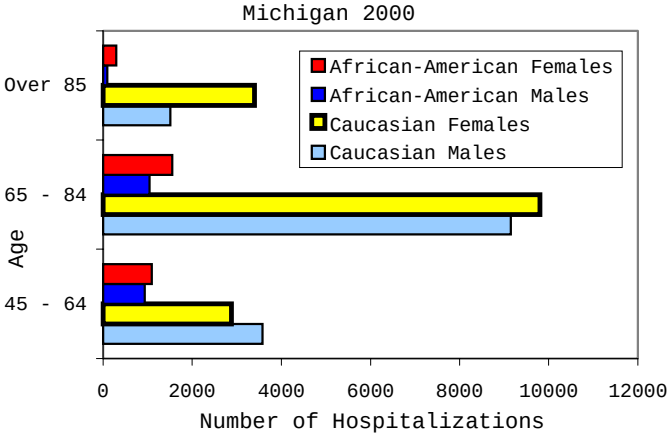


Figure 2
Number of Stroke Hospitalizations, Michigan 2000



WHAT IS STROKE?[1]

Stroke is a form of cardiovascular disease, which occurs when a blood vessel bringing oxygen to the brain bursts or is clogged by a blood clot. Without oxygen, nerve cells die within minutes, and the part of the body controlled by those cells cannot function. There are two major types of stroke: thrombotic which accounts for 70 - 80% of all strokes and hemorrhagic. Hemorrhagic stroke, caused by ruptured blood vessels, has a much higher fatality rate and tends to occur in younger age groups

AGE-ADJUSTED MORTALITY

Trends in age-adjusted stroke mortality rates (Figure 3) illustrate the gender and racial differences discussed on the previous page. Stroke mortality rates declined dramatically throughout the 20th century. After 1992, the decline ended, and race and gender specific age-adjusted stroke mortality rates increased for African-American males and females while rates were stable or increased slightly for Caucasian males and females.

AGE-SPECIFIC MORTALITY

For the most part, trends in race and gender age-specific mortality rates mirror the pattern in age-adjusted rates, showing steady declines between 1980 and 1992 and then stabilizing or increasing thereafter. However, the reversal in the steady decline of stroke mortality has varied by age group.

45 - 64 year olds

Figure 4 illustrates the consistent decline in stroke mortality rates for all four race-gender groups, age 45-64, between 1980 and the early 1990s. Rates increased for African-American males after 1992 and decreased for the other groups. This age group also displays the largest racial disparities in stroke mortality.

65 - 84 year olds

Trends in stroke mortality in this age group (data not shown) are similar to the other age groups. However, the absolute rate of stroke mortality is now much higher (350-500 per 100,000 person years). After 1992, increases in stroke mortality rates were seen in African-American and Caucasian males. Increases for African-American females were modest and rates for Caucasian females remained level. Racial differences in stroke mortality begin to disappear after age 65.

85 years of age and over

As observed in Figure 5, Caucasians now have higher stroke mortality rates than African-Americans. After 1992, stroke mortality increased in African-Americans and remained steady for Caucasians. Stroke death rates are extremely high in this age group. As an example in 2000, rates for Caucasian males 85 years and older were 67 times greater than for Caucasian males 45-64.

Figure 3
Age-Adjusted Death Rates by Race and Gender due to Stroke
Michigan, 1980 - 2000

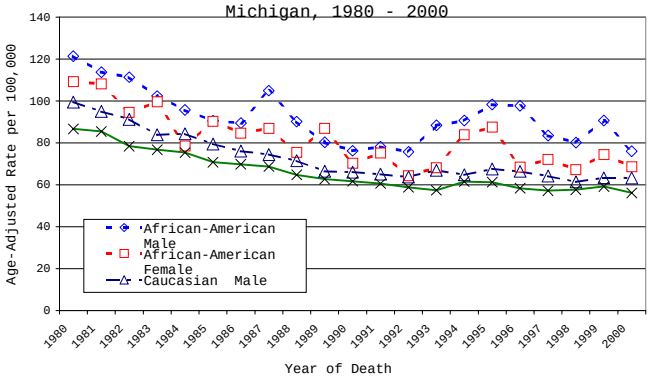


Figure 4
Age-specific Mortality Rates by Race and Gender due to Stroke
Age 45 - 64, Michigan, 1980 - 2000

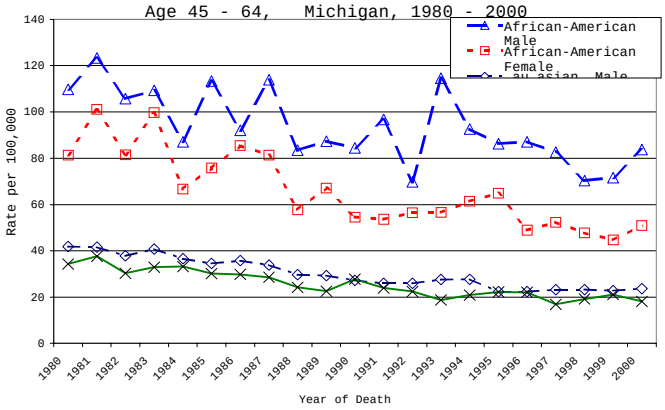
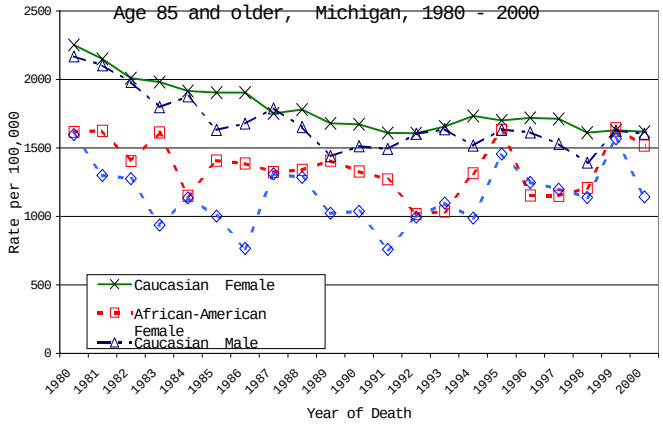


Figure 5
Age-Specific Mortality Rates by Race and Gender due to Stroke
Age 85 and older, Michigan, 1980 - 2000



RACIAL DIFFERENCES IN MORTALITY

African-American males and females have a higher risk of dying from stroke than Caucasians at younger ages. After age 85, the risk is higher for Caucasians.

Risk of Stroke Death, Michigan, 2000
African-Americans versus Caucasians

Age Group	45-64	65-74	74-84	>85
Male	3.5	1.8	0.9	0.7
Female	2.8	1.5	1.0	0.9

Figure 6 illustrates that between 1980 and 2000, the risk of stroke for African-American females compared to Caucasian females increased for the youngest and oldest age groups. Similar patterns were seen among males.

PRIMARY PREVENTION

Table 1 describes risk factors for stroke. Controlling high blood pressure, high cholesterol, and reducing smoking will have the greatest effects on reducing stroke rates. For example, the risk ratio indicates that a person with high blood pressure is over four times as likely to have a stroke than someone with normal blood pressure. Other risk factors include age, gender, family history, previous stroke and socioeconomic status. The 2001 Behavioral Risk Factor Survey indicated that Michigan has very high rates for the major risk factors for stroke. It is estimated that 71.9% of the adults in Michigan have at least one risk factor for stroke. Over 38.6% have two or more risk factors.

PREVALENCE OF STROKE RISK FACTORS, BRFS, 2001

Risk Factor	Michigan	U.S.	Rank
High Blood Pressure	27.1%	NA	NA
Cigarette Smoking	26.1%	22.9%	11
No Leisure Activity	23.5%	25.8%	32
Overweight (BMI>25)	61.1%	57.1%	NA
Obesity (BMI>30)	24.7%	21.1%	3
Diabetes	7.2%	6.6%	11
High Cholesterol	33.0%	NA	NA

SECONDARY PREVENTION - ACUTE CARE TREATMENT

The use of anti-platelet and anticoagulant therapies (e.g. aspirin, coumadin, ticlopidine, etc.) have proven very effective in the secondary prevention of stroke. In addition, carotid stents and endarterectomy are also used to prevent stroke in high risk patients. Use of thrombolytic therapy (tPA or recombinant tissue plasminogen activator) for treatment of acute ischemic stroke has great potential for improving survival and decreasing disability.

Figure 6
African-American versus Caucasian Stroke Mortality
Rate Ratio and 95% Confidence Intervals, Females
Michigan, 1980 - 1990 - 2000

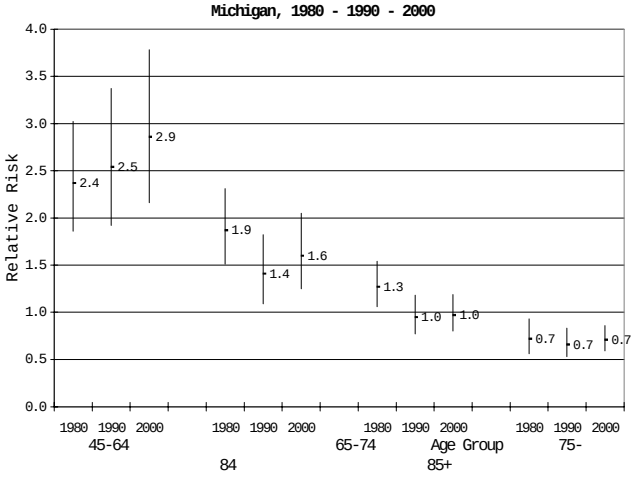


Table 1
Risk Factors for Stroke[2]

Magnitude of Risk	Risk Ratio	Attributed Proportion	Range
Strong Risk Ratio > 4	High Blood Pressure	26%	20-50%
Moderate Risk Ratio 2-4	High Cholesterol	***	0-20%
	Diabetes	3%	0-7%
	Cigarette Smoking	12%	11-25%
	Obesity	20%	15-25%
Possible	Physical Activity	***	***
	Alcohol Use	***	***
	Very Low cholesterol	***	***

Guidelines to Reduce Stroke-National Stroke Association[3]

1. Know your blood pressure; have it checked annually; and keep high blood pressure under control.
2. Find out if you have atrial fibrillation and take the prescribed medications if you do.
3. If you smoke, stop.
4. If you drink alcohol, do so in moderation.
5. Know your cholesterol level; follow your doctor's recommendations to keep high cholesterol under control.
6. If you are diabetic, follow your doctor's recommendations.
7. Include exercise in the activities you enjoy in your daily routine.
8. Enjoy a lower sodium and fat diet.
9. Find out if you have circulation problems and take the prescribed medications if you do.

Resources

STATE

Michigan Department of Community Health Cardiovascular Health, Nutrition And Physical Activity Section
3423 M.L. King, Jr. Blvd. P.O. Box 30195
Lansing, MI 48909
517-335-8374

NATIONAL

American Stroke Association
A Division of the American Heart Association
7272 Greenville Ave.
Dallas, TX 75231-4596
1-888-478-7653
http://www.strokeassociation.org

National Institute of Neurological Disorders and Stroke
National Institutes of Health
31 Center Drive, MSC 2540
Building 31, Room 8A06
Bethesda, MD 20892-2524
1-800-352-9424
http://www.ninds.nih.gov

National Heart, Lung and Blood Institute
National Institutes of Health
P.O. Box 30105
Bethesda, MD 20824-0105
301-251-1222
http://www.nhlbi.nih.gov

METHODS

Mortality data were obtained from the 1980-2000 Michigan Resident Death File (MRDF) and hospitalization data were obtained from the 2000 Michigan Inpatient Data Base (MIDB) maintained by the Division of Vital Records and Health Statistics in the Michigan Department of Community Health.
All certificates contained in the MRDF coded as ICD-9-CM codes 430-438 (cerebrovascular disease) as the underlying cause of death were analyzed. The MIDB contains records of each admission for all short-stay acute care facilities in Michigan as well as abstracts for Michigan residents hospitalized in bordering states. Because the MIDB does not contain unique identifiers, multiple admissions for the same individual cannot be detected. To limit potential bias, only cases with a primary diagnosis of ICD-9-CM 430-438 were analyzed.
Population estimates for rate calculations were obtained from the Michigan Office of the State Demographer.
Stroke and hospitalization rates were age-adjusted using the direct method: the U.S. 2000 population estimates were used as the standard. National age-adjusted rates were obtained from the National Center for Health Statistics.
Risk factor estimates were obtained from the 2000 Michigan Behavioral Risk Factor Survey.
Mortality rate ratios and 95% confidence intervals were calculated for age, race and gender groups using STATCALC in EpiInfo 6.04.

1. Adapted from: National Stroke Association:http:/www.stroke.org 1998
2. Adapted from: NewschafferCJ, BrownsonCA, Dusenbury LJ. Cardiovascular Disease. *Chronic Disease Epidemiology and Control* eds. Brownson RC, Remington PL, Davis JR Washington D.C. American Public Health Association. 1998 and Bronner et al.: Primary prevention of stroke *NEJM* 1995;333(21):1392-1400
3. National Stroke Association: NSA releases stroke prevention guidelines. http:/www.stroke.org/Newsletters /Current/newsletter.html. April 1998

Suggested citation: Hogan JG. Epidemiology of Stroke Fact Sheet , Bureau of Epidemiology, Michigan Department of Public Health, December 2002.

For further information about the Stroke Epidemiology Fact Sheet, contact either the Epidemiology Services Division at the Michigan Department of Community Health (517) 335-8806 or the Cardiovascular Health, Nutrition and Physical Activity Section (517) 335-8374.